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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/628,059	07/25/2003	Jochen Alkemper	2695	4140

7590 07/22/2005
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EXAMINER

ROSASCO, STEPHEN D

ART UNIT PAPER NUMBER

1756

DATE MAILED: 07/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/628,059

Applicant(s)

ALKEMPER ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☒ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>9/20/04</u> . | 6) <input type="checkbox"/> Other: _____ |

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Detailed Action

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Krauth (6,835,503) or Tong et al. (6,387,572).

The claimed invention is directed to a substrate for EUV microlithography, comprising a base layer in which the base layer comprises ceramic and/or glass ceramic (Zerodur), a coefficient of thermal expansion of at most 0.1 ppm/degree C and at least one covering layer, which comprises silicon dioxide, a coefficient of thermal expansion of at most 1 ppm/degree C, and a thickness of 0.01 to 100 μm , and a surface roughness of at most 0.5 nm rms.

Krauth teaches an optimal substrate would have a high degree of surface flatness, in order to achieve the desired reflectivity of the reflective layers, and a low CTE, in order to minimize expansion of the substrate. However, an inverse relationship exists between the surface flatness and thermal expansion properties of commonly used substrates. For example, silicon is commonly used as a substrate in EUV reticles because of its easily obtainable surface flatness characteristics. However, silicon has a relatively high CTE (2.5 ppm/degree C). Other substrates commonly used in EUV reticles include ultra-low expansion materials, such as ULE.TM. glass or ZERODUR.TM. glass ceramic. While

ULE.TM glass has a low CTE (0.02 ppm/degree C), it has a high number of scratches or defects on its surface and, therefore, is not flat.

Krauth also teaches that the material of the planarizing layer 6 have a peak-to-valley surface flatness of less than 20 ANG and, preferably, less than 10 ANG. The polymer XP2766 provides the desired peak-to-valley surface flatness of less than 20 ANG while both DUV42 and AB3 provide the desired peak-to-valley surface flatness of 10 ANG. The optical properties of the planarizing layer 6 are not critical to the invention because the overlying reflective layer 8 reflects the EUV radiation before it reaches the planarizing layer.

The thickness of the planarizing layer 6 is not critical because the reflective layer 8 reflects the EUV radiation before it passes through other layers of the EUV reticle 2. However, the thickness of the planarizing layer 6 may be affected by the number of defects in the surface of the substrate 4. If the substrate 4 is substantially free of surface defects, the planarizing layer 6 may be formed as a thin film. However, if the substrate 4 has numerous surface defects, the planarizing layer 6 may be formed to a sufficient thickness to cure or remedy the surface defects by covering them with the flat surfaced planarizing layer 6. Preferably, the planarizing layer 6 ranges in thickness from approximately 1,000 ANG to 10,000 ANG. For example, the planarizing layer 6 may be spin-coated to a thickness that covers or fills in scratches or other defects in the substrate 4. It is contemplated that the planarizing layer 6 may be approximately 1000 ANG thick.

Tong et al. teach a substrate for reflective EUV lithography comprising: a first layer that has a low coefficient of thermal expansion, and a second layer, formed on the first layer, that has a high surface quality, that is between about 0.2 and about 5 microns thick,

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and that consists essentially of at least one of the materials selected from the group consisting of silicon, sapphire, germanium, beryllium, and silicon carbide.

And wherein the second layer consists essentially of silicon and has a coefficient of thermal expansion that is higher than the coefficient of thermal expansion of the first layer.

And wherein the first layer has a coefficient of thermal expansion that is less than about 0.1 ppm/degree C at temperatures employed during EUV lithography; and comprises a low CTE glass selected from the group consisting of titanium silicate glass and ceramic glass.

Tong et al. also teach a photolithographic mask comprising this substrate.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
07/13/05